Course Overview

Geometry is one of the oldest and most fundamental branches of mathematics. While we commonly think of Euclid's geometry, there are many others and this course will be an exploration of geometries. We will start with an overview of Euclidean geometry and the axiomatic method. Next we'll add coordinates to Euclidean geometry and investigates the strengths (and weaknesses) of doing so. The last half of the course will be an exploration of two important, non-Euclidean geometries (projective and hyperbolic) that have become important in modern mathematics.

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Email	`ffdam@uaf.edu`
Phone	474-1196
Web	`http://www.math.uaf.edu/~maxwell`
Required Text	**Four Pillars of Geometry**, *John Stillwell*, Springer-Verlag

Optional Texts

From time to time I will use material from other texts to supplement the course. Other good texts I have in mind are

- **Geometry: Euclid and Beyond**, *Robin Hartshorn*
- **A Course in Modern Geometries**, *Judith N. Cederberg*
- **Experienceing Geometry**, *David W. Henderson* and *Daina Taimina*.
- **Euclidean and Non-Euclidean Geometries**, *Marvin J. Greenberg*.

You are welcome to borrow my personal copies of these texts for a day or two if you'd like.

Prerequisites:

MATH F202 and MATH F215 are required. If you have not taken both of these courses, contact me immediately. We'll also use a little linear algebra in this class, but I'll teach what we need as we go along.

Class Time

We will meet three times a week for an hour each session. The classes will be a mixture of traditional lectures as well as group work some days.

During the group work sessions, you will be working in small groups of three students or so on a collaborative problem. Your group may be called upon to present a solution to the problem or to lead a discussion concerning its solution or challenges.

Lecture Times
MWF 2:15–3:15 Chapman 107

Office Hours

I will schedule 3 hours a week of formal office hours. These times will be chosen after consulting with my classes. I will post the times on my website and outside my office door. I have an open door policy; if I'm in

my office and my door is open, please feel free to drop by with questions. You are also welcome to schedule a meeting outside of my formal office hours by sending me an email.

Sometimes I work in my office with my door closed and am a little forgetful about the start of office hours. Feel free to knock!

Homework

There will be a homework assignment due every Friday at 4:30pm in my box. Homework will be listed on my web page, and will be assigned on as we progress through each day's lectures. Your first homework has been posted.

The course web page will also contain solutions to the less routine problems for each week's homework. If you are interested in the solution of a problem that is not listed on the web site, please come by office hours.

Regarding late homework, I will accept from each student a single late homework with no questions asked. You must notify me no later than the time the homework is due that you intend to take advantage of this opportunity, and you must hand in the homework no later than one week after it was due. Subsequent late homeworks will be accepted only under extenuating circumstances to be determined at my discretion.

Midterms

There will be two in-class midterm exams to be (*tentatively*) held on February 28 and March 29.

Final Exam

There will be a two-hour final exam on Wednesday May 7 at 1:00pm. The exam will be comprehensive.

Project

Each student will complete a project for the class delving into an aspect of geometry not directly covered in class. The project will will consists of an oral presentation and a component to be turned in.

The oral presentation will be about 20 minutes long and will be held during the last two weeks of class. We'll schedule these times later. You will also hand in, on the last day of class, a short paper concerning your topic along with any software, models, etc that are part of the project.

The goal of the project is to allow you to explore an area of geometry and to report back on it to the class. Your topic should reflect your interests. You could explore a specific area of geometry I don't cover (There are lots! e.g. Möbius geometry, the geometry of spacetime, fractals, higher dimensional hyperbolic or projective geometry, ...), expand upon an advanced problem from the required or optional texts, research an aspect of history in geometry, construct software of geometric interest, etc. I can help you with directions to explore in. You will need to schedule a short meeting to discuss your thoughts on a project idea no later than Friday, February 22. You must submit a one page written project proposal by Friday, March 21.

Participation

From time to time in the course we will break into groups and work on problems. Sometimes your group will be asked to present the solution or lead a discussion of the problem. There will be lots of opportunities during the formal lectures for you to stop me and ask questions. All these are forms of class participation. There is a modest part of your grade (5%) associated with class participation. This shouldn't be a part of your grade you think much about; if you are usually actively present during class you will receive the full participation grade.

Evaluation

Course grades will be determined as follows:

Homework	30%
Participation	5%
Midterm 1	15%
Midterm 2	15%
Project	15%
Final	20%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower these thresholds.

A+	97–100%	C+	77–79%	F ≤ 59
A	93–96%	C	70–76%	
A-	90–92%	C-	(not given)	
B+	87–89%	D+	67–69%	
B	83–86%	D	63–66%	
B-	80–82%	D-	60–62%	

Tentative Schedule

Week	Topics and Events
1/25	Recalling Euclid.
1/28 – 2/1	Constructions from Euclid
2/4 – 2/8	Euclid and the Axiomatic Method Friday: Last day to drop.
2/11 – 2/15	Euclid and the Axiomatic Method (continued)
2/18 – 2/22	Coordinates, Transformations, Isometries Friday: Deadline for first project meeting.
2/25 – 2/29	Vector geometry Friday: Midterm
3/3 – 3/7	Perspective
3/10– 3/14	Spring Break
3/17 – 3/21	Perspective (continued). Start Projective Planes. Friday: Deadline for written project proposal.

Week	Topics and Events
3/24 – 3/28	Projective Planes (continued). Friday: Midterm Friday: Last day to withdraw with a W
3/31 – 4/4	Transformation Groups.
4/7 – 4/11	Noneuclidean Geometry Wednesday: Midterm
4/14 – 4/18	Noneuclidean Geometry (continued) Friday: SpringFest (no classes)
4/21 – 4/25	Catch-up
4/28 – 5/2	Student Presentations
5/5	Student Presentations (continued) Wednesday: Final Exam, 1-3 p.m.

Rules and Policies

Collaboration

You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams

You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform

me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance
Attendance is included indirectly as part of your grade in the participation category; if you are absent you can't participate! One of the best things you can do to succeed in a math class is to attend every class. If for some reason you have an unavoidable conflict and will miss a class, please send me an email to let me know that you will be away.

Cell Phones
Turn off your cell phone before you come to class.

Disabilities Services
I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade
Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals
A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty
Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.